**Habitable Zones Lab Worksheet**

Hypothesis:

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What was your group’s criterion for defining the inner and outer boundaries for the Habitable Zone?

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| **Station 1** | **Distance from Bulb Center**  **to Inner Boundary (cm)** | **Distance from Bulb Center**  **to Outer Boundary (cm)** |
| **Bulb Wattage:**  \_\_\_\_\_\_\_\_\_\_\_ | Strip 1:\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 2:\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 3: \_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 4:\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 5: \_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 6:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 7:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 8:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  average:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Strip 1:\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 2:\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 3: \_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 4:\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 5: \_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 6:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 7:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 8:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  average:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| **Station 2** | **Distance from Bulb Center**  **to Inner Boundary (cm)** | **Distance from Bulb Center**  **to Outer Boundary (cm)** |
| **Bulb Wattage:**  \_\_\_\_\_\_\_\_\_\_\_ | Strip 1:\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 2:\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 3: \_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 4:\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 5: \_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 6:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 7:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 8:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  average:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Strip 1:\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 2:\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 3: \_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 4:\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 5: \_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 6:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 7:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 8:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  average:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| **Station 3** | **Distance from Bulb Center**  **to Inner Boundary (cm)** | **Distance from Bulb Center**  **to Outer Boundary (cm)** |
| **Bulb Wattage:**  \_\_\_\_\_\_\_\_\_\_\_ | Strip 1:\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 2:\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 3: \_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 4:\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 5: \_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 6:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 7:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 8:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  average:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Strip 1:\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 2:\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 3: \_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 4:\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 5: \_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 6:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 7:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Strip 8:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  average:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

**Questions and Conclusions**

On a separate sheet of paper answer the following:

1. On a piece of graphing paper, make a graph of the inner boundary distance from the center of the bulb in cm plotted against the wattage of the light bulbs. Draw a smooth curve through the points. Label the curve “Inner Boundary.” On the same graph plot the outer boundary distance versus the wattage of the light bulbs. Draw a smooth curve and label it “Outer Boundary.”
   * What does the graph indicate to you?
2. What do you notice about the inner and outer boundaries of the Habitable Zone as you go to higher wattage bulbs?
   * Do you think the same thing happens for Habitable Zones around stars as you go to higher luminosities?
3. Calculate the distance between the inner and outer boundaries – the width of the Habitable Zone – for each wattage bulb and make a graph of the width in cm as a function of the wattage.

Bulb Wattage Width of Habitable Zone (in cm)

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1. What does the graph indicate?
2. What do you notice about the width of the Habitable Zone as you go to higher wattage bulbs?
   * Do you think that this happens when for Habitable Zones around stars as you go to higher luminosity stars?
   * How does this result affect the probability of a planet existing inside a star’s Habitable Zone?
3. Based on this evidence and the data that you have collected what conclusions can you draw about the stars most likely to have a Habitable Zone? Does your data support your original hypothesis? Why or why not?

Based on what you have previously learned in class about stellar evolution and the solar system:

1. What will happen to the Habitable Zone as a star gets older? Will it increase or decrease? Why?
2. In our solar system was Earth always in the Habitable Zone or has the zone changed over time with the age of the sun? Do you think other planets may have been located in the Habitable Zone when the solar system was first formed? If so, which planets and why?
3. What do you think will happen to the Habitable Zone found in our solar system as the sun ages? What will be the fate of Earth?